

Supplementary appendix

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APPENDIX

Which neurological disorders are included in the GBD estimates?

Neurological disorders currently analysed and presented in the GBD Study include stroke, brain and other nervous system cancers, traumatic brain injury [TBI] and spinal cord injury [SCI], Alzheimer's disease and other dementias, Parkinson's disease, multiple sclerosis, motor neuron disease, idiopathic epilepsy, migraine, tension-type headache, central nervous system infectious conditions (tetanus, meningitis, encephalitis), and a residual category comprising of other less common neurological disorders, such as muscular dystrophy, Huntington disease etc.. Other frequent neurological conditions like restless-legs-syndrome or essential tremor are not yet part of the GBD-database. All neurological disorders included in the GBD estimates are presented and analysed both separately and combined.

How to access and interpret GBD estimates

The most recent 2017 GBD estimates of the burden of individual neurological disorders as well as the burden of these disorders attributable to various risk factors can be accessed and downloaded from the GBD Compare Viz Hub.¹ While GBD estimates for each neurological disorder separately allow comparisons between individual disorders (these estimates can be used for estimating resources required for individual neurological disorders and determining priorities) at a country-level. Their combined estimates are important for determining the overall burden of neurological disorders (these estimates can be used for estimating resources required for neurological services) and for comparison with other grouped disorders, such as cardiovascular diseases (excluding stroke), disorders of the digestive system diseases etc. Application of such estimates can be used towards defining priorities for service developments and research funding allocation for groups of disorders).

Table: Global absolute numbers and age-standardised rates of deaths, DALYs, incidence and prevalence per 100 000 people by neurological disorder and percent changes between 1990 and 2016 (adapted from GBD 2016 Neurology Collaborators The Lancet Neurology 2019, with permission)²

Cause	All-age numbers (thousands)		Age-standardised rate (per 100 000)				
Metric	2016	Percent change from 1990 to 2016	2016	Percent change from 1990 to 2016	Males	Females	Male to female ratio
Tetanus							
Deaths	37 (22 to 47)	-89 (-91 to -86)	1 (0 to 1)	-91 (-93 to -88)	1 (0 to 1)	0 (0 to 1)	1.6 (0.8 to 2.2)
DALYs	2 367 (1 446 to 3 063)	-90 (-93 to -88)	34 (20 to 43)	-91 (-93 to -89)	41 (21 to 56)	26 (16 to 35)	1.6 (0.9 to 2.2)
Incidence	90 (51 to 121)	-89 (-92 to -86)	1 (1 to 2)	-91 (-93 to -88)	2 (1 to 2)	1 (1 to 1)	1.7 (1.0 to 2.4)
Meningitis							
Deaths	318 (265 to 409)	-21 (-36 to 9)	5 (4 to 6)	-36 (-47 to -12)	5 (4 to 7)	4 (3 to 6)	1.3 (0.9 to 1.9)
DALYs	21 866 (18 205 to 28 281)	-28 (-42 to 3)	306 (254 to 398)	-36 (-48 to -10)	328 (261 to 428)	284 (224 to 423)	1.2 (0.8 to 1.7)
Incidence	2 821 (2 464 to 3 310)	13 (10 to 16)	39 (35 to 46)	-4 (-7 to -1)	42 (36 to 49)	37 (32 to 44)	1.1 (1.1 to 1.1)
Encephalitis							
Deaths	103 (84 to 138)	-2 (-36 to 70)	1 (1 to 2)	-27 (-51 to 21)	2 (1 to 2)	1 (1 to 2)	1.2 (0.8 to 1.6)
DALYs	6 704 (5 469 to 8 574)	-15 (-44 to 41)	93 (76 to 118)	-32 (-54 to 10)	92 (75 to 124)	93 (74 to 124)	1.0 (0.7 to 1.3)
Incidence	6 534 (5 957 to 7 165)	29 (26 to 33)	90 (82 to 98)	-5 (-6 to -4)	82 (75 to 90)	99 (90 to 109)	0.8 (0.8 to 0.9)

Stroke							
Deaths	5 528 (5 335 to 5 735)	28 (22 to 33)	87 (83 to 90)	-36 (-39 to -34)	103 (99 to 107)	72 (69 to 77)	1.4 (1.3 to 1.5)
DALYs	116 445 (111 385 to 121 407)	22 (17 to 27)	1 711 (1 635 to 1 784)	-34 (-37 to -32)	2 046 (1 961 to 2 126)	1 408 (1 320 to 1 489)	1.5 (1.4 to 1.5)
Incidence	13 677 (12 713 to 14 692)	78 (73 to 83)	203 (189 to 218)	-8 (-11 to -6)	231 (215 to 248)	179 (166 to 192)	1.3 (1.3 to 1.3)
Alzheimer's disease and other dementias							
Deaths	2 382 (2 060 to 2 778)	148 (140 to 157)	41 (35 to 48)	4 (1 to 6)	37 (32 to 44)	43 (37 to 49)	0.9 (0.9 to 0.9)
DALYs	28 764 (24 511 to 33 952)	121 (115 to 127)	471 (401 to 556)	2 (0 to 4)	439 (373 to 523)	490 (417 to 576)	0.9 (0.9 to 0.9)
Prevalence	43 836 (37 756 to 51 028)	117 (114 to 121)	712 (614 to 828)	2 (1 to 2)	645 (555 to 752)	757 (652 to 879)	0.9 (0.8 to 0.9)
Parkinson's disease							
Deaths	211 (168 to 265)	161 (152 to 171)	3 (3 to 4)	19 (16 to 23)	5 (4 to 6)	3 (2 to 3)	1.8 (1.7 to 1.9)
DALYs	3 235 (2 564 to 4 013)	148 (140 to 156)	51 (41 to 63)	22 (18 to 26)	67 (53 to 83)	39 (31 to 49)	1.7 (1.6 to 1.8)
Prevalence	6 063 (4 971 to 7 325)	145 (138 to 152)	94 (77 to 114)	22 (18 to 25)	112 (92 to 135)	80 (65 to 97)	1.4 (1.4 to 1.4)
Epilepsy							
Deaths	126 (119 to 136)	9 (-3 to 30)	2 (2 to 2)	-24 (-32 to -11)	2 (2 to 2)	1 (1 to 2)	1.5 (1.4 to 1.7)
DALYs	13 492 (11 015 to 16 503)	9 (-3 to 24)	183 (149 to 223)	-19 (-28 to -9)	201 (167 to 241)	164 (131 to 204)	1.2 (1.2 to 1.3)

Prevalence	23 962 (20 402 to 27 737)	48 (34 to 63)	327 (278 to 378)	6 (-4 to 17)	334 (286 to 387)	320 (272 to 372)	1.0 (1.0 to 1.1)
Multiple sclerosis							
Deaths	19 (17 to 21)	61 (19 to 74)	0 (0 to 0)	-12 (-35 to -5)	0 (0 to 0)	0 (0 to 0)	0.7 (0.6 to 0.9)
DALYs	1 151 (969 to 1 346)	66 (45 to 75)	16 (13 to 18)	-4 (-16 to 1)	12 (10 to 14)	19 (16 to 23)	0.6 (0.5 to 0.7)
Prevalence	2 221 (2 034 to 2 437)	88 (85 to 90)	30 (28 to 33)	10 (9 to 12)	19 (18 to 21)	41 (37 to 45)	0.5 (0.5 to 0.5)
Migraine							
DALYs	45 122 (29 046 to 62 827)	51 (50 to 53)	599 (386 to 833)	0 (-1 to 0)	422 (274 to 587)	778 (500 to 1 084)	0.5 (0.5 to 0.6)
Prevalence	1 044 771 (999 535 to 1 087 969)	48 (47 to 49)	13 847 (13 255 to 14 418)	-2 (-2 to -2)	9 356 (8 962 to 9 753)	18 408 (17 623 to 19 194)	0.5 (0.5 to 0.5)
Tension-type headache							
DALYs	7 195 (4 615 to 10 500)	53 (47 to 58)	96 (62 to 140)	0 (-3 to 2)	77 (50 to 113)	115 (74 to 167)	0.7 (0.7 to 0.7)
Prevalence	1 890 670 (1 707 786 to 2 097 762)	37 (35 to 39)	25 130 (22 741 to 27 895)	-7 (-8 to -7)	20 369 (18 312 to 22 765)	29 962 (27 231 to 33 041)	0.7 (0.7 to 0.7)
Motor neuron disease							
Deaths	34 (33 to 35)	94 (80 to 102)	1 (0 to 1)	8 (0 to 12)	1 (1 to 1)	0 (0 to 0)	1.5 (1.4 to 1.5)
DALYs	926 (882 to 962)	59 (45 to 72)	13 (13 to 14)	-2 (-9 to 3)	16 (15 to 16)	11 (10 to 11)	1.5 (1.4 to 1.5)
Prevalence	331 (300 to 367)	67 (62 to 72)	5 (4 to 5)	5 (3 to 6)	5 (5 to 6)	4 (4 to 5)	1.3 (1.2 to 1.3)

Brain and nervous system cancer							
Deaths	227 (205 to 241)	64 (54 to 82)	3 (3 to 3)	-2 (-8 to 8)	4 (3 to 4)	3 (2 to 3)	1.4 (1.2 to 1.6)
DALYs	7 660 (6 923 to 8 280)	36 (26 to 55)	105 (95 to 113)	-10 (-16 to 3)	122 (106 to 135)	88 (77 to 97)	1.4 (1.2 to 1.6)
Prevalence	781 (693 to 818)	97 (84 to 115)	11 (10 to 12)	25 (17 to 34)	12 (10 to 13)	10 (9 to 11)	1.1 (1.0 to 1.3)
Traumatic Brain Injuries							
DALYs	8 000 (5 856 to 10 108)	77 (17 to 157)	111 (82 to 141)	9 (8 to 9)	141 (104 to 180)	82 (61 to 101)	1.8 (1.2 to 2.6)
incidence	27 082 (24 302 to 30 299)	47 (44 to 51)	369 (331 to 412)	4 (2 to 5)	471 (427 to 520)	264 (232 to 301)	1.8 (1.7 to 1.9)
Spinal Cord Injuries							
DALYs	9 522 (6 700 to 12 449)	40 (36 to 44)	130 (90 to 170)	-10 (-13 to -7)	145 (100 to 188)	113 (80 to 146)	1.3 (1.1 to 1.5)
Incidence	935 (781 to 1 155)	39 (33 to 49)	13 (11 to 16)	-4 (-7 to 4)	15 (12 to 18)	11 (9 to 14)	1.4 (1.3 to 1.5)
Other neurological disorders							
Deaths	53 (51 to 55)	66 (51 to 78)	1 (1 to 1)	1 (-5 to 5)	1 (1 to 1)	1 (1 to 1)	1.4 (1.3 to 1.5)
DALYs	3 695 (3 114 to 4 353)	54 (39 to 68)	51 (43 to 60)	11 (2 to 20)	55 (47 to 64)	46 (38 to 55)	1.2 (1.1 to 1.3)
All Neurological Disorders							
Deaths	9 039 (8 772 to 9 364)	39 (34 to 44)	144 (140 to 149)	-28 (-30 to -26)	160 (155 to 166)	129 (124 to 135)	1.2 (1.2 to 1.3)

DALYs	276 143 (246 544 to 307 994)	15 (9 to 21)	3 968 (3 557 to 4 396)	-27 (-31 to -24)	4 204 (3 855 to 4 575)	3 755 (3 272 to 4 279)	1.1 (1.1 to 1.2)
* DALYs for TBI and SCI include YLDs only as ICD rules for cause of death reporting require that injury deaths are assigned to causes rather than consequences							

References

1. Institute for Health Metrics and Evaluation (IHME). GBD Compare Data Visualization. Seattle, WA: IHME, University of Washington, 2019. Available from <https://vizhub.healthdata.org/gbd-compare/>. (Accessed 22 February 2019).
2. GBD 2016 Neurology Collaborators. Global, regional, and national burden of neurological disorders, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Neurology* 2019; [http://dx.doi.org/10.1016/S1474-4422\(18\)30499-X](http://dx.doi.org/10.1016/S1474-4422(18)30499-X).